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AUTHOR Galvan, Dennis
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ABSTRACT

A study investigated acquisition of three independent yet simulatneously produced morphological systems in American Sign Language (ASL): the linguistic use of space, use of classifiers, and inflections for aspect, all information incorporated into the production of a sign. Subjects were 30 deaf children with severe or profound prelingual hearing loss: four groups of native signers (ages 3, 5, 7, and 9) and two groups of late signers (ages 5 and 9, introduced to signing at age 2-4), each containing five children. Subjects looked through and then signed a story from a picture book. Their performance in using seven morphologically complex verbs was analyzed. Results showed striking differences between native and late signers on all measures relating to the internal complexity of the analyzed verbs, while measures unrelated to internal complexity did not show the same kind of qualitative differences. The pattern of development found indicates that the native signers use the morpheme as their basic linguistic unit of analysis, while late signers use the lexical item itself. This difference does not exist at the sentence level. The findings support claims that late signers treat signs as gestalts rather than as independent, simultaneously-produced systems and experience impaired later morphological development. (MSE)

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A Sensitive Period for the Acquisition of Complex Morphology: Evidence from American Sign Language

Dennis Galvan
Department of Cognitive Science
University of California, Irvine

Recent investigations by Mayberry, Fischer, and Hatfield (1983) and Newport (1984), into the use of American Sign Language (ASL) by deaf persons with deaf parents (native signers) and those with hearing parents (late signers), suggest that late signers are using signs as unanalyzed wholes. Newport (1984) provides striking evidence of this from a study conducted by Ted Supalla and herself. Results indicated that neither age, nor the number of years of signing was predictive of significant effects. In contrast, the age at which the deaf person first learned to sign (native, early, or late) was a significant factor. The signs of these late learners did not incorporate all of the required inflections.

Newport asks why it is that older deaf children or adolescents learning ASL for the first time (early and late signers), are not as adept at learning the morphological complexities of ASL as are young native signers. After all, physiologically an older child should have more available memory and better cognitive processing abilities than a younger child. One possibility is that an older child's ability to see the gestalt of a sign may actually impair his/her ability to see the parts. In other words, late signers may be using the lexicon, or sign, as their basic linguistic unit of analysis.

If we assume that a young infant has limited memory and/or cognitive processing abilities, it follows that the infant native signer may only be able to comprehend components of a sign, such as its handshape or movement, and may be unable to retain very many features of a sign in mind at any one time. If Newport's suggestion is correct, and the late signers are using a holistic unit of analysis, then we should see very different patterns of development in major morphological subsystems for native and non-native signers.

As native signers mature, the internal morphological complexity of verbs in ASL increases (Newport and Meier, 1985). This development can be expected to continue past 5 and possibly as late as 10. If the late signers are using a holistic approach, then the morphological complexity of the sign should remain constant across age. If the late signers are using an analytical approach, we could expect the development of the various subsystems to parallel that of the native signers. This study investigated the morphological complexity of verbs used in a narrative by native and late signing deaf children.

Method:

To investigate this possibility, the acquisition of three independent, yet simultaneously produced morphological systems in ASL were examined. These include; the linguistic use of space, the use of classifiers, and inflections for aspect. Unlike spoken languages, ASL incorporates

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additional information into a sign via simultaneously produced layers rather than sequentially produced units. Variations in the use of space (where the beginning and end points of a sign are), the use of classifiers (handshapes and linguistic use of the body) or in aspectual inflections (changes in movement) all contribute unique information to a sign.

Thirty deaf children with severe or profound prelingual hearing losses and no secondary handicapping conditions, and two deaf native signing adults participated in this study. Four groups of native signers (ages 3, 5, 7, and 9), and two groups of late signers (ages 5 and 9) all attended the California School for the Deaf in Fremont. Each group of children consisted of five subjects. Unfortunately, there were not enough late signers to include 3 and 7 year olds. All native signers have deaf parents and have been exposed to ASL since birth and all late signers have hearing parents and no other deaf family members. The late signers were first introduced to some kind of sign language (usually a signed English system) between the ages of 2 and 4.

The subjects were videotaped either at school or at home. As one of several psycholinguistic tasks, the subjects were asked to first look through, then sign, the story from the picture book "Frog, Where Are You?" by Mercer Mayer (New York, Dial Press, 1969). They were allowed to look at the pictures while telling the story. All videotapes were transcribed and coded by the researcher (a hearing native signer) and an ASL researcher (a deaf native signer).

Seven verbs were chosen for this analysis. The ability to use morphologically complex verbs has been shown to be a reliable indicator of fluency in ASL (Supalla, 1982). The seven verbs chosen were some of the most common verbs in the story and were chosen because they were used by all age groups and because they represent different kinds of verbs in ASL.

Comparing the performance of native and late signers was difficult because of the small number of subjects (five) per group. To equalize each subject's contribution to the data, scores were averaged within verbs for each subject. Each subject had a maximum of seven scores, one for each verb. This procedure also controls for individual differences in story length. With five subjects per cell, there was a maximum of thirty-five data points per group. It was not uncommon for subjects to not use one of the seven verbs at all in their rendition of the story. This was coded as an omission. Omissions were excluded from my calculations, which made statistical computations difficult because of unequal sample size between age groups and the small numbers overall. Consequently, significance testing was not performed on these data. Instead, frequencies of occurrence of particular forms are outlined.

Results and Discussion:

In this study there are striking differences between native and late signers on all measures relating to the internal complexity of the analyzed verbs. These measures include the use of space, classifier use, inflections for aspect, and the general internal complexity of a sign. Measures unrelated to the internal complexity of a sign do not show the same kind of qualitative differences. For example, a simple count of the number of signs used by the subjects reveals very similar patterns of development. The average number of signs in a story increases with age for

native and late signers. This measure does not take into account the number of morphemes per sign, only the total number of discrete signs in a story.

Development of Spatial Reference:

The four spatial inflections examined in this study include signs that are; uninflected, inflected to the book, inflected to an arbitrary point, inflected to an arbitrary point with a previous reference. If the development of each type of spatial inflection is parallel for native and late signers, then it can be posited that overall development of spatial reference is also parallel.

The course of development for uninflected forms is very interesting. These results, shown in Figure 1, indicate that while 3 year olds use more uninflected forms of the analyzed verbs than the other forms, the frequency of uninflected forms increases at ages 5 and 7, then decreases dramatically at 9. Adults rarely use the uniflected form of the verb.

Insert Figure 1 Here

The inflecting of a verb to a book is not mentioned in previous literature and therefore may not have been examined in previous research. The native signing 3 year olds use this form extensively while the older native signers do not use it at all. In this relatively immature use of spatial reference, it seems that the book, and specific pictures in the book, are being used as a physically present object, to which these verbs are being inflected.

Native signing 9 year olds are establishing spatial loci for various referents and are beginning to maintain those loci over several utterances. This is reflected in their increased number of verbs inflected to an arbitrary point both with and without previous reference. Between age 9 and adulthood, however, the verbs with previous reference surpass those without previous reference. Adults are establishing and using locations in the signing space on regular basis at this point.

The development of spatial inflections for late signers shown in Figure 2, is very different than that for native signers. Contrary to the native signers, the frequency of uninflected signs for late signers increases between ages 5 and 9 as the frequency of signs inflected to an arbitrary point decreases.

Insert Figure 2 Here

For the 5 year old late signers the high frequency of verbs inflected to an arbitrary point is due to the random placement of signs in the signing space. This interpretation of the data is supported by the corresponding low frequency of verbs inflected to an arbitrary point with previous reference. This could be due to chance alone. The inflection of a verb to an arbitrary point with a previous reference is an indication that the signer is beginning to use space linguistically. There is no evidence that the 5 year old late signers are using the signing space linguistically in this narrative. This is not to claim that late signers at this age would not understand or use some simpler uses of space such as

verb agreement for present referents (e.g., I-GIVE-YOU or YOU-GIVE-ME). The developmental patterns of spatial reference by native and late signers are viewed as evidence of qualitative differences in development.

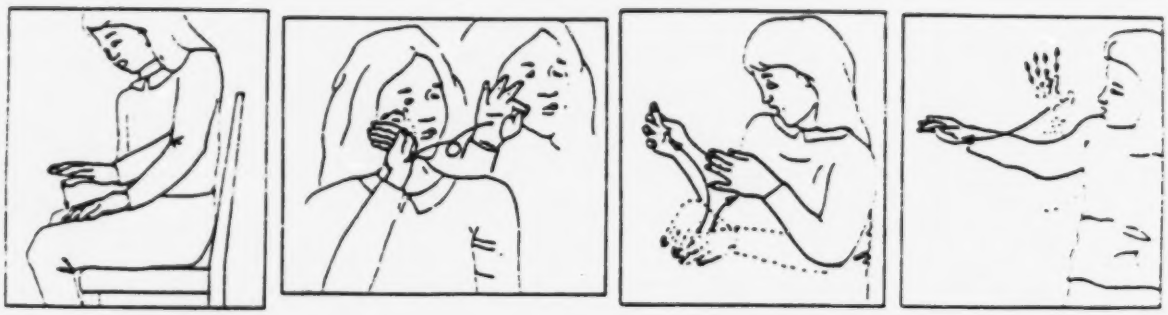
Illustrations 1 and 2 are examples of a native signer and a late signer commenting on the same picture. The dog is jumping on the tree, the beehive falls and shatters followed by the bees emerging from the beehive, now on the ground. Illustration 1 shows a 9 year old native signer signing the sentence:

Illustration 1

DOG-PUSH-IT SMALL-ROUND-THING-FALLS-DOWN SMALL-ROUND-THING-SHATTERS

This sentence uses the downward direction of the falling in the second sign. It is very clear that a small round thing, in this case the beehive, is falling down. In contrast, Illustration 2 depicts a very different version of the same scene. Here a 9 year old late signer signs:

Illustration 2



DOG BEE OPEN MANY-SMALL-THINGS-FLY

This sentence uses no spatial reference at all. We don't know what opened, why it opened, or how the act of opening is connected to the dog and the bees.

Development of Classifier Use:

A second feature of ASL acquisition analyzed here is the use of classifiers to mark secondary objects and grammatical relations. Again, there are different patterns of development for native and late signers.

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Results shown in Figure 3 indicate an overall increase in the number of classifiers used by native signers as they mature. Late signers, however, actually show a decrease in the frequency of classifier use.

Insert Figure 3 Here

Illustrations 1 and 2 also show the differences between the analytic use of classifiers and the use of unanalyzed forms. The sentence shown in Illustration 1 contains several classifiers. In the first sign the boy uses his body as a body classifier for the dog pushing the beehive. The second sign uses a C-shape handshape as a Size and Shape Specifier (SASS) classifier for a small round thing falling. The last sign also uses a SASS classifier and shows the beehive shattering.

In contrast, the sentence in Illustration 2 contains no explicit reference to the beehive. Only the last sign could be a classifier sign but even this is in doubt. Earlier in this girl's rendition of the story she asked the test administrator what was happening in the picture. She responded:

BEE MANY-SMALL-THINGS-FLY

It appears as if this late signer simply copied this second sign as a whole. In support of this interpretation is her use of the sign OPEN (open a box), which indicates that she is not analyzing the components of this verb. The frozen form of the verb OPEN is taken from the prototypical action of opening a small cardboard box. Each hand is a SASS classifier for a wide-flat flap moving from a flat closed to an upright open position. This subject used this form to refer to the opening of a window and the opening of the beehive after it fell. The verb OPEN has presumably not yet been analyzed by this subject.

Development of Aspectual Inflections:

The overall frequencies of aspectual inflections for the different groups shown in Figure 5 indicate that for the native signers, aspectual inflections are acquired relatively early. The performance of the late signers is very different than that of the native signers. Late signers do not seem to be paying attention to the variations in the sign's movement, or if they are, they are not incorporating that variation. The sharp drop in frequency of aspectual inflections by 9 year old late signers would again indicate a qualitative difference in linguistic processing between the native and late signers.

Insert Figure 4 Here

Development of the Internal Complexity of a Sign:

The development of the three morphological subsystems can be better understood if we consider how they are integrated in the sign itself. The morphemes included in this measure of internal complexity are: 1) the verb itself, 2) any classifiers used to mark a subject, object, or grammatical relation, and 3) any aspectual inflections articulated simultaneously with the verb. Figure 5 shows how the number of morphemes within a verb increases for the native signers, but not for the late signers.

Insert Figure 5 Here

Development of Contextual Complexity:

It is assumed that the complexity of the utterance is a reflection of cognitive development. The sentence in which the analyzed verb occurred was coded as: 1) a label (FALL), 2) a description (BOY FALL or FALL WATER), 3) a relationship (BOY FALL WATER or JAR-OVER-HEAD), or 4) a causal relationship (DEER STOP, BOY FALL). Figure 6 reveals parallel patterns of development for both groups with late signers exhibiting an approximate two year delay.

Insert Figure 6 Here

Conclusions

This pattern of development indicates that native signers use the morpheme as their basic linguistic unit of analysis, while late signers use the lexical item itself. This conclusion is supported by the finding that the number of morphemes per sign increases with age for the native signers, but not for the late signers. This difference between native and late signers does not exist at the sentence level. Both native and late signers use increasingly complex sentences as they mature. The interesting finding here is that late signers show cognitive development without morphological development.

These findings support Newport's claims that late signers treat signs as gestalts, rather than as independent, simultaneously produced systems. Late signers, being first exposed to signs when they are cognitively more developed, are able to see the sign as a whole. They then use the sign, rather than the morpheme, as their basic linguistic unit of analysis, thus impairing later morphological development.

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Figure 1

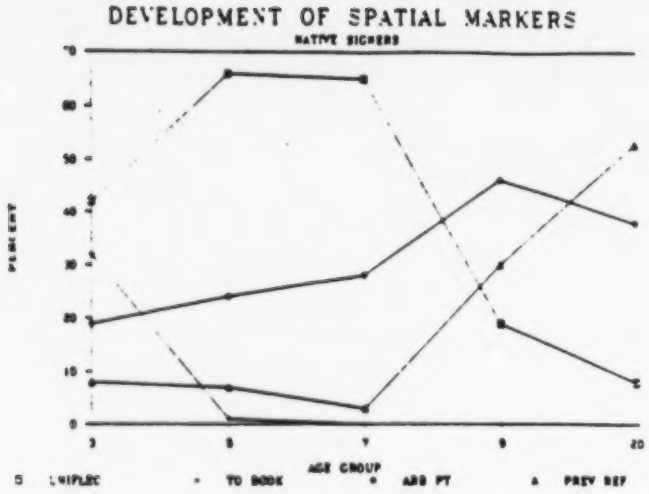

Figure 2

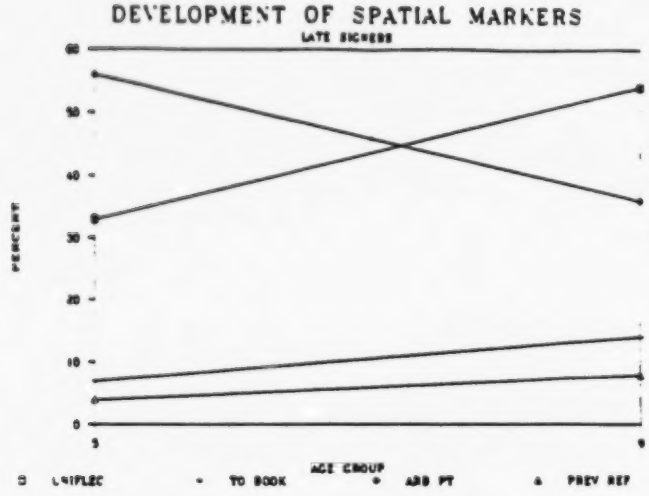

Figure 3

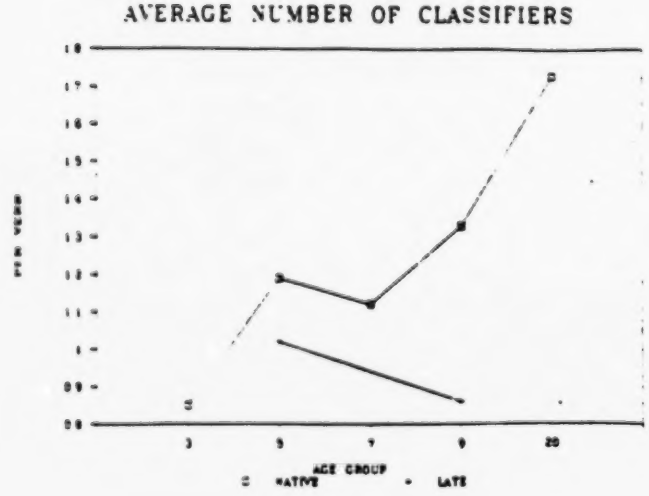

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Figure 4

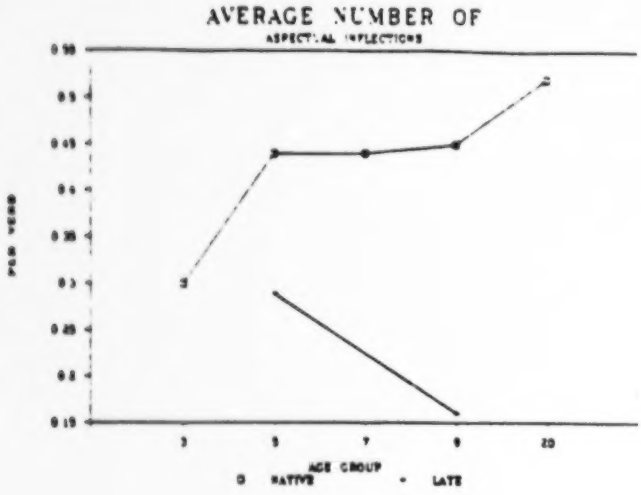

Figure 5

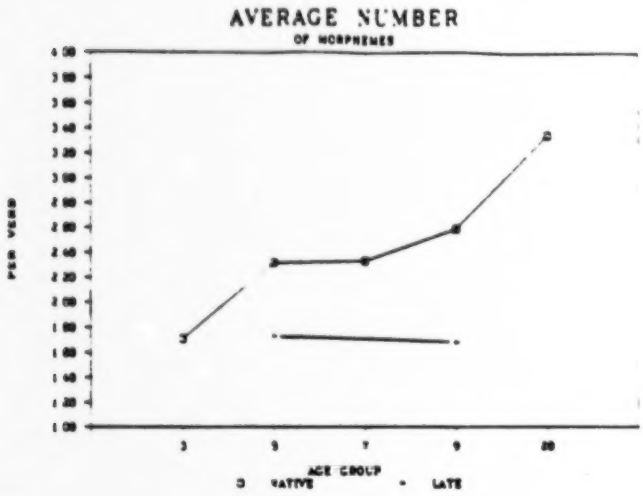

Figure 6